

Arthrex Presents:

Breakthroughs in Hand and Wrist Technology

Fall 2020

2020 has been another exciting year for the Distal Extremities team with the launch of the new 1.4/1.6/2.0/2.4 Mini Comprehensive Fixation System (Mini CFS) and the Nano Corkscrew® and Nano SwiveLock® anchors. The continued innovation in both the metal and soft-tissue sector of the business has catapulted Arthrex to the forefront of the hand and wrist market.

The Nano SwiveLock and Nano Corkscrew anchor lines have opened up new techniques in the smaller bones of the hand. *InternalBrace™* ligament augmentation, especially for collateral ligament repairs and reconstructions, has continued to show tremendous growth, with more clinical studies underway and some early results published.¹

Mini CFS (mini frag) is a comprehensive offering of plates, screws, and intramedullary screws that allows us to address all current fixation preferences and techniques. The set is being used throughout the body, from adjunct anterior clavicle plating to elbow plating, down to hand and foot and ankle.

With the challenge of COVID-19, our Medical Education department has continued to educate through live, online webinars. We will have a live webinar during the virtual ASSH meeting and hope to return to in-person courses in the late fall. Arthrex has always been on the forefront for medical education, and we continue to look for new opportunities to engage with our surgeon community.

We look forward to continued innovation in the next year and thank you for your support of Arthrex. Stay tuned for more updates or visit us on [Arthrex.com](https://www.Arthrex.com).

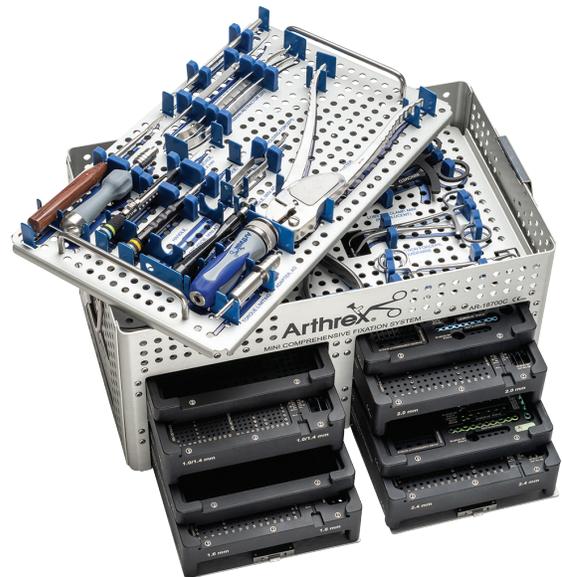
Pete Denove

Senior Director, Product Management
Distal Extremities and Trauma

Mini Comprehensive Fixation System (CFS)

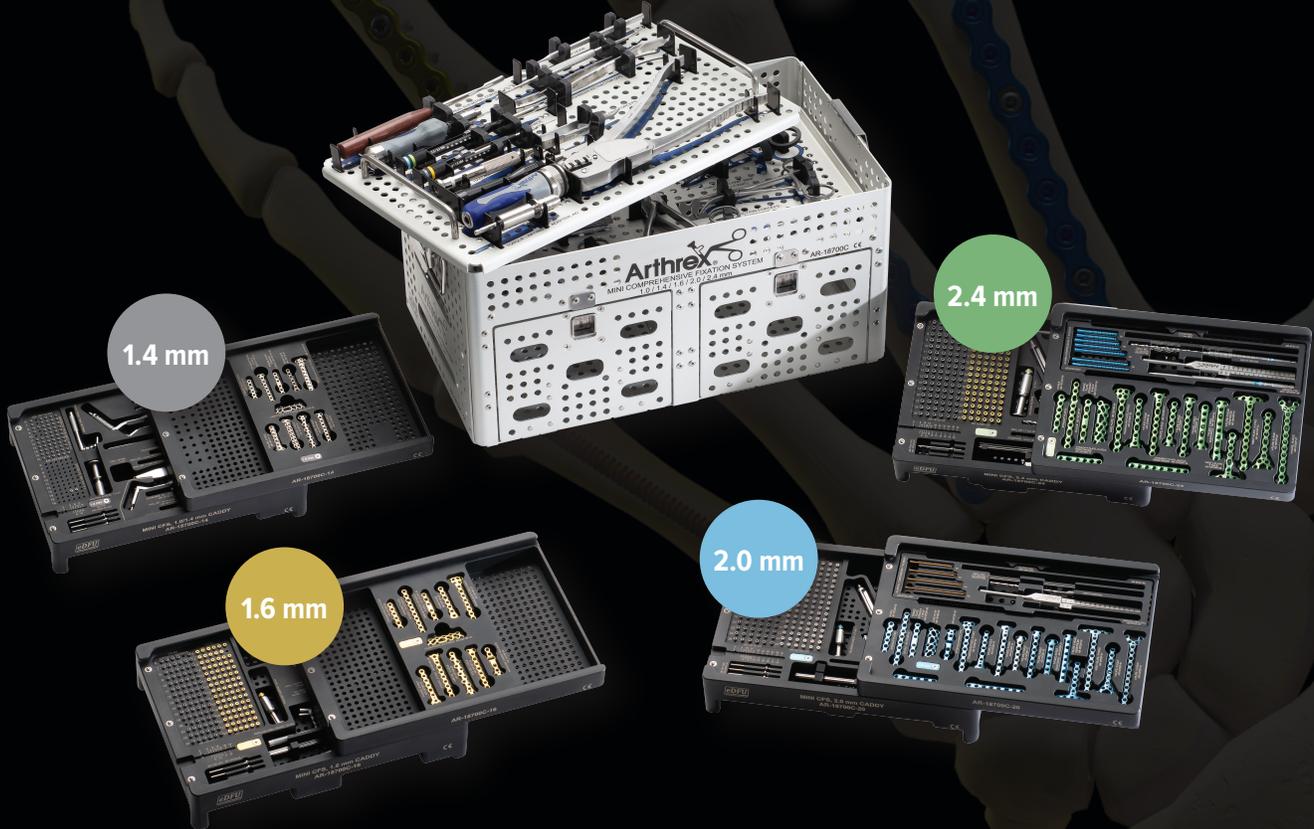
Arthrex is pleased to announce the addition of Mini CFS. The Mini CFS system is a comprehensive set with 1.4, 1.6, 2.0, and 2.4 mm plating options. The addition of fully threaded Compression FT screws for intramedullary fixation for metacarpal fractures gives the surgeon complete freedom to choose the fixation option needed for the different fracture patterns.

To support the release of this system, a wide variety of multimedia assets describing techniques and tips and pearls are available on [Arthrex.com](https://www.Arthrex.com). Animations, surgical technique guides, and further fracture treatment in the upper and lower extremities are also featured.



Mini Comprehensive Fixation System

Mini Plates, Big Solutions



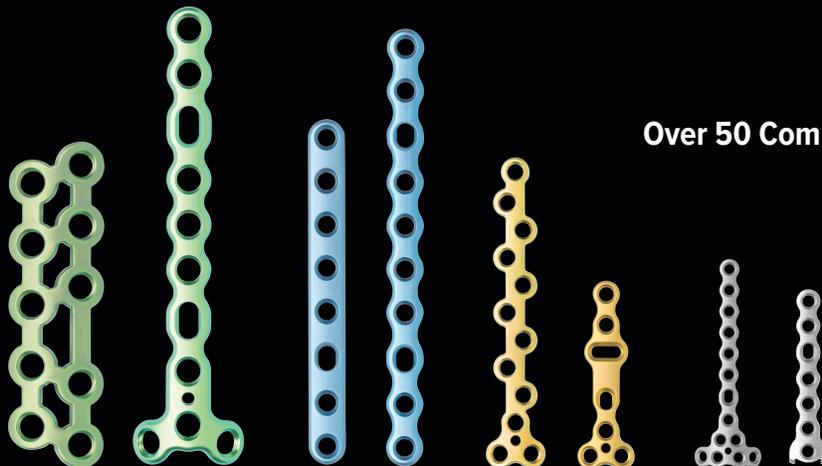
Choose between intramedullary screw fixation and plating options only available in the Arthrex Mini CFS set



2.5 mm × 50 mm
Micro Compression FT™ screw



3.5 mm × 60 mm
Mini Compression FT™ Screw



Over 50 Comprehensive Plating Options

2.4 mm

2.0 mm

1.6 mm

1.4 mm

Arthrex
Ad.Arthrex.com/MiniCFS

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New Product Highlight

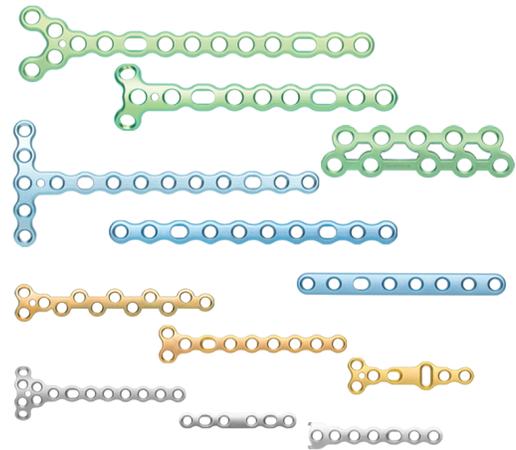
Mini Comprehensive Fixation System



Mini CFS

The Arthrex Mini Comprehensive Fixation System is a comprehensive solution for mini fragment fixation and fusion needs. Multiple modules within the system offer 1.0 mm screws, 1.4 mm plates/screws, 1.6 mm plates/screws, 2.0 mm plates/screws, and 2.4 mm plates/screws along with associated instrumentation.

- Comprehensive solution for mini fragment fixation and fusion
- 56 plating options
- Color-coded modules with corresponding instrumentation
- Radiolucent and optimized instrumentation



New Product Highlight

NanoScope™ Operative Arthroscopy System

Size Matters in Hand and Wrist Arthroscopy

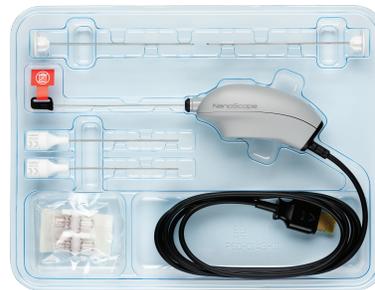
Introducing the 2.2 mm NanoScope imaging system and nano-scale, single-use, sterile-packed arthroscopy instrumentation. Harnessing 20 years of excellence in designing arthroscopic hand instrumentation, Arthrex has engineered the next generation of instruments for diagnostic, resection, and extraction procedures. Just 2 mm in diameter, these instruments are designed for atraumatic insertion through tight joint spaces.

The portable system allows the surgeon to perform minimally invasive arthroscopy during preoperative, intraoperative, and postoperative phases of care – with the NanoScope system as the main arthroscope or as an adjunct to a conventional arthroscope.



Tablet Control Unit Components

- 13" HD monitor
- Handpiece connector
- Microphone
- Ethernet, USB, and HDMI ports



Single-Use Camera Kit Components

- Disposable camera
- 2 Inflow cannulas
- 1 Sharp obturator
- 1 Blunt obturator
- 2 Fluid stopcocks



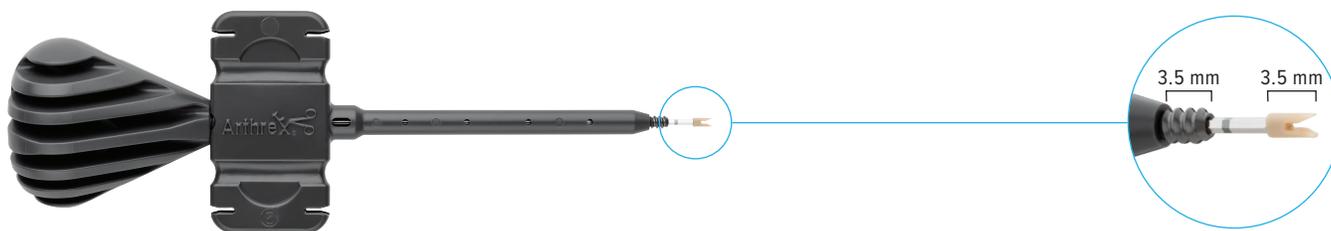
New Product Highlight

The Nano Anchors



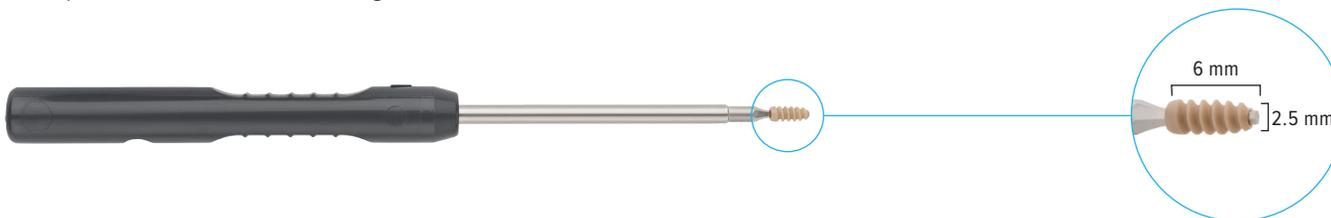
Nano SwiveLock® Anchor

The 2.5 mm Nano SwiveLock anchor was specifically designed for the small bones in the hand and wrist. With its 7 mm length, PEEK eyelet, and titanium anchor body, the anchor allows surgeons to perform ligament repairs with an *InternalBrace*™ augmentation in the phalanges and elsewhere. This anchor was designed to be used with 1.3 mm SutureTape in conjunction with FiberWire® suture.



Nano Tenodesis Anchor

Complementing the Nano SwiveLock anchor is the newly released 2.5 mm × 6 mm PEEK Tenodesis screw. The Tenodesis screw is meant for reconstructions with *InternalBrace* augmentation, while the SwiveLock anchor is meant for repairs with *InternalBrace* augmentation.



Nano Corkscrew® Anchor

Designed specifically for the small bones of the hand, the 1.7 mm × 5 mm Nano Corkscrew FT suture anchor is loaded with 3-0 FiberWire suture and a ½-circle tapered needle. It offers superior pull out compared to competitive anchors.²



New Product Highlight

Compression FT Extended Screw Lengths

The Arthrex Compression FT (fully threaded) screws are now available in extended lengths in a range of diameters. They are also included in the new Mini CFS (frag) system for a truly comprehensive approach to metacarpal and phalangeal fractures.

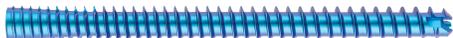
2.5 mm Micro Compression FT™ Screws

8 mm-14 mm (1 mm increments)
16 mm-50 mm (2 mm increments)



3.5 mm Mini Compression FT™ Screws

12 mm-60 mm (2 mm increments)

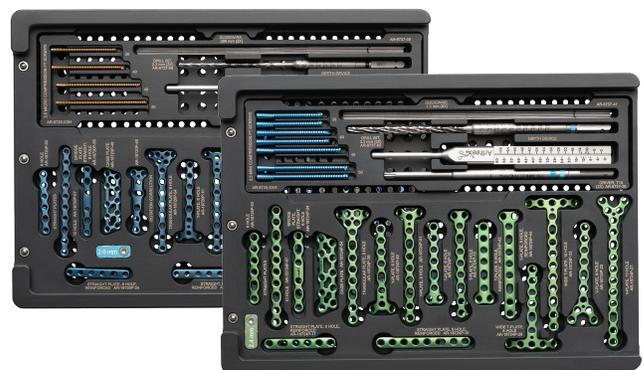


4.0 mm Standard Compression FT Screws

16 mm-60 mm (2 mm increments)



- **Variable-Stepped Thread Pitch** – Wider thread pitch at the tip of the screw enters the bone faster than each trailing thread, compressing the fragments progressively as the screw is advanced.
- **Headless Titanium Screws** – Can be implanted intra-articularly and extra-articularly with minimal risk of impingement or soft-tissue irritation.
- **Self-tapping Flutes** – Two sets of cutting flutes ease insertion after drilling and facilitate efficient OR time.
- **Multiple Screw Options, including 2.5, 3.5, and 4.0 Cannulated** – Assists accurate placement for both percutaneous and open procedures.
- **Improved Torque Transmission** – Hexalobe recess in 3.5 and 4.0 Compression FT screws and hex drive for 2.5 screw.



What's in My Bag?

Mini CFS Roundtable



Steven S. Shin, MD



Steven J. Lee, MD



Damon C. Adamany, MD

Q. The Arthrex Mini Comprehensive Fixation System (CFS) launched earlier this year. What stands out about the system for you?

A. Shin: The variety of instruments offered separates this system from others. The fine-toothed Kocher clamp is extremely useful for the atraumatic maintenance of reduction of small fracture fragments. The radiolucent lobster claw is also very useful; I hope that more instruments can be radiolucent in the future. The variety of plate designs is also a strength of this set; any small bone fracture can be fixed with one of the many plates offered in this set, or just screws if a plate isn't needed.

Lee: The name "Comprehensive" says it all; it really is the ultimate tool chest for fixing any and all types of fractures. It's comforting to know that this one set can take care of whatever you might be presented with. Also, it addresses some of the most frustrating aspects of fracture care by providing comprehensive fracture reduction clamps, designing secure screw holding sleeves, and even eliminating the need to measure screws.

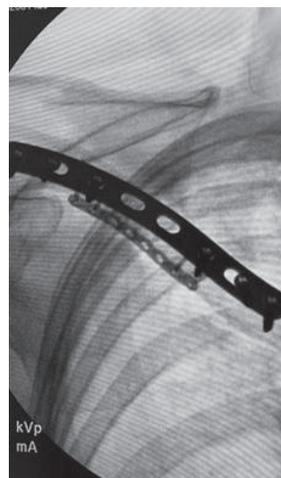
Adamany: I love the flexibility of the set. Not only can I do small joint arthrodesis, but I can also do fracture fixation of the hand and wrist while only having to open one set.

Q. Have you had any interesting cases you want to share (elbow, ulna, clavicle, etc)?

A. Shin: I enjoy my thumb MCP fusion cases even more now using the 6-hole "fusion" plate from this set. The plate is easily bendable and, instead of a hole, the sturdy middle section lies nicely over the joint.

Lee: Besides various complex hand fractures, this set is so versatile for other locations. I've used it to fix fractures of the radial neck, coronoid, as an adjunct to the primary plate for a complex Monteggia fracture, for distal ulna fractures, as the second plate for a clavicle nonunion double plate, etc.

Adamany: I have an ulnar shaft fracture and a bony UCL injury (two separate cases).

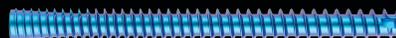


What's in My Bag? (Cont.)

Mini CFS Roundtable



2.5 Micro Compression FT™ Screw



3.5 Mini Compression FT™ Screw

Q. This is the first system to include long compression screws for intramedullary fixation. What has been your experience with this and how has your view on intramedullary fixation changed over time?

A. Lee: I was admittedly a slow adopter of intramedullary screw fixation until I used this system. It clearly has advantages over more traditional methods of plating and K-wires, such as less irritating hardware, stronger fixation allowing earlier rehabilitation protocols, and earlier return to sports and work.³

Adamany: Like most surgeons, I was initially resistant to this technique and worried about the cartilage. As I have now seen, I am able to place the screw in the dorsal third of the metacarpal which helped get an athlete back to play quickly.

Q. Do you have any tips and tricks after your first few cases?

Lee: I like the fact that the drill sizes mirror the K-wire sizes so they can be used interchangeably in case the drill is bent, dropped or, for whatever reason, mixed up. I personally like reading the screw sizes off of the drill guide, especially with locking screws since the measurement doesn't necessarily need to be as exact to provide the same biomechanical strength.³ This, coupled with the stadium seating, allows me to save so much time and annoyance waiting for my screw!

Adamany: It really depends on the case. For fracture fixation, I encourage you to use the BB-Tak for provisional fixation. Additionally, I have sometimes used only a small K-wire instead of the drill for the 1.4 mm screws because I like the control of using the collet and K-wire as I can adjust the working length of the "drill" easier.



What's in My Bag?

Proximal Row Carpectomy With ArthroFLEX® Dermal Allograft



Steven J. Lee, MD

Q. How did you come up with the idea of using an ArthroFLEX* graft, an acellular dermis, as a cushion for your PRCs?

A. ArthroFLEX dermal allograft is used for superior capsular reconstruction in the shoulder. When I've done that procedure, I was surprised how tough and strong it was and even more amazed that it was working in the shoulder. We are used to doing capsular interpositions for patients who have some wear and tear, but we all know that material is so flimsy. We also know about collagen formation from the hematoma distraction model for basal joint arthritis. I thought, why not put in way more collagen that is much more stout and durable? It's difficult even to put a needle through ArthroFLEX dermal allograft and it feels much stronger than any other biologic interposition that I have used before.

Q. When do you decide to use this technique over a standard PRC or four-corner fusion (4CF)?

A. The decision tree for PRC versus 4CF remains more or less the same for me depending on patient factors and needs. However, any time I do a PRC and there is even a hint of wear on either the capitate or the radius, I will put ArthroFLEX dermal allograft in. Certainly, any time I'm thinking about the possibility of a wrist fusion or total wrist, I'll try this first.

Q. This technique has been published in JHS. Are you following up with your patients?

A. Yes, with surprisingly good results so far. In the beginning, I only really did this procedure on patients who were indicated for wrist fusions, basically the worst version of arthritis that wouldn't have been successfully treated with PRC or 4CF. I was surprised how well these patients did, and they were grateful that they didn't need a fusion. I have probably done about 20 of these procedures, and I've had two failures, both from the graft slipping out. I've modified my technique subsequently to try to make sure the graft is secured onto the capitate/hamate as much as possible using a combination of through-and-through drill holes and bone anchors.

Patients will often have some dorsal swelling of the wrist until 6 months to a year, which I tell my patients ahead of time. The pain relief and maintenance of ROM is really gratifying.

Q. What are some tips and pearls when you are doing this procedure?

A. The McGlamry is a life saver, and something I've told many surgeons to use any time you are trying to take small bones out. With no exaggeration, it takes me 12 to 15 minutes to take all three bones out!

I will request the thickest ArthroFLEX dermal allograft available (usually around 3 mm) and double it over, suturing it together so that it doesn't unfold, giving me about 6 mm of thickness.

I then put two drill holes through and through the capitate and hamate and shuttle the sutures placed in the ArthroFLEX dermal allograft into the volar holes, and tie them dorsally. I usually add anchors radially and ulnarly, giving a box-type configuration to secure the graft. Securing the graft is the most important step!

I'll add an AIN/PIN neurectomy to help with pain relief.

I have gone back and forth about putting in a K-wire, but since I've had two grafts slip out, I've been putting them back in, casting 4 weeks, then using a wrist immobilizer for another 4 weeks, followed by therapy. The graft will look surprisingly thick on x-ray, but this will decrease to half its size, usually within 3 to 6 months. The ROM and strength averages at least 80% to 85% compared to the contralateral side.

Q. Where else are you using biologics in the hand? Do you think this is the next frontier?

A. I have realized that biologics, in so many forms, are going to continue to give us our greatest achievements over the next 10 to 20 years, from stem cell manipulation, to accelerating healing and making our repairs and reconstructions stronger, to offering new treatments we've never thought possible. I'm really excited to see where we go from here!

*ArthroFLEX is a registered trademark of LifeNet Health.

What's in My Bag?

Nano Arthroscopy in Sports Medicine



AJ Mencias, MD

Dr. Mencias discusses the benefits of the 2.2 mm single-use NanoScope™ system and the impact a less-invasive imaging tool has on their facility and patients. The portability of the NanoScope visualization system allows surgeons to perform minimally invasive arthroscopy in the operating room, in a procedure room, or diagnostically in the physician's office. The NanoScope system provides an alternative, advanced option to MRI and second-look arthroscopy, and the ability to guide injections under precise visualization.

Q. Why use the NanoScope system and Nano arthroscopy instrumentation versus your traditional systems?

A. The Arthrex NanoScope system makes all forms of arthroscopy easier. For the elbow, wrist, thumb, and other digits, the NanoScope system facilitates minimally invasive arthroscopic surgery that is even better than using standard arthroscopic instrumentation. It is THE definition of minimally invasive surgery. Because the NanoScope camera is the size of a needle, there is easier visualization and less intra-articular crowding with instrumentation; in the smaller joints of the upper extremity, this is a key feature. There is easier visualization of hard-to-reach spots intra-articularly. In addition, the instrumentation and tools are smaller and less invasive, which facilitates other portals that are not possible with standard arthroscopic instrumentation. These benefits will promote additional arthroscopic procedures not yet commonplace for orthopedic surgeons and upper extremity specialists. For example, the ability to scope the basilar thumb joint with ease and efficiency is a huge benefit of Nano technology.

Q. For diagnostic imaging and visualization, what patients benefit most from NanoScope technology?

A. Patients with intra-articular injuries and abnormalities of the wrist, digits, and elbow benefit most from NanoScope technology. It allows surgeons to be much less invasive in their treatment of intra-articular injuries and problems of the upper extremity, including problems related to scapholunate ligament injuries, lunotriquetral ligament injuries, TFCC injuries,

basilar thumb osteoarthritis, cartilage abnormalities of the elbow, and ligamentous and tendon injuries of the elbow. I have personally treated several of my basilar thumb osteoarthritis patients with NanoScope technology. They have recovered much quicker and had outstanding results and they are happy with their quick return to activities because of this extremely minimally invasive surgery.

Q. Which procedures and products does the NanoScope system benefit most?

A. NanoScope instrumentation will make us much better surgeons, especially for injuries of the scapholunate ligament and repair of the DCSS. In addition, treating TFCC injuries will be facilitated by NanoScope technology and instrumentation. I also believe that, at some point very soon, we will be able to use this Nano technology for carpal tunnel releases, cubital tunnel releases, trigger releases, de Quervain's releases, and other soft-tissue release procedures. We can also visualize the delivery of orthobiologic injections intra-articularly using NanoScope technology.

Q. What are your post-op protocols after a NanoScope procedure? Does it differ from standard arthroscopy?

A. I have definitely allowed a quicker return to normal activities with my NanoScope patients. They have less pain, swelling, and other issues after surgery. My physical and occupational therapists are impressed with the minimally invasive nature of this technology.



What's in My Bag? (Cont.)

Nano Arthroscopy in Sports Medicine

Q. With the image quality and Nano arthroscopic instrumentation, do you feel this can be the next evolution of less-invasive arthroscopy?

A. We are already working on techniques using Nano arthroscopy to make patient care less invasive. Most of the arthroscopic procedures being performed today can become even safer, less invasive, and less painful; we can therefore improve our level of patient care. NanoScope™ technology will allow us to push the development of the next generation of arthroscopic procedures in upper extremity. In addition, we will become even better at performing the routine arthroscopic procedures that we do every day. Where a needle can be inserted so can the NanoScope device; this is very exciting technology.

Q. As a collegiate team physician, how can the NanoScope system speed up time for diagnosis and recovery for faster return to play?

A. In taking care of the hand, wrist, and elbow injuries for the University of Notre Dame athletic department, I know that it is paramount to speed up the diagnosis of an injury and to safely and carefully speed up the return to play. NanoScope technology can be used in lieu of an MRI when necessary to speed up diagnosis and to check for soft-tissue and cartilaginous healing. This will definitely increase the skill, accuracy, and quality of care that we give patients, especially high-level athletes.

Q. How will NanoScope technology impact your elbow and UCL procedures?

A. The NanoScope system will definitely increase the ease and broaden the scope of using elbow arthroscopy in treating soft-tissue injuries, cartilage lesions, and possibly nerve lesions and compression around the elbow. Because the instrumentation and arthroscopy equipment are smaller, we will be able to make elbow arthroscopy safer and less invasive. Elbow arthroscopy can become quicker and more efficient and we will develop more procedures that will improve the quality, efficiency, and scope of care we can give patients.

Q. We are seeing a shift in patient awareness of opioid prescriptions. Can the NanoScope technology continue the trend of eliminating opioid prescriptions after surgery?

A. Because of the extremely minimally invasive nature of NanoScope arthroscopy, there will be a direct correlation with decreased use of narcotics postsurgery. Oftentimes we are not using suture to close incisions anymore. Instead, we are using Steri-Strips and smaller dressings. Often, no narcotics are prescribed after NanoScope surgeries and we typically use acetaminophen and ibuprofen for postoperative pain control.

Q. We have seen accelerated rehab successes recently with high-level athletes and the advancements of InternalBrace™ ligament augmentation. Do you foresee the NanoScope making a positive impact on return to play and work for patients?

A. I absolutely believe NanoScope technology will make a positive impact on return to play and work for patients because it is easy to use, minimally invasive, and minimally traumatic. We will be able to obtain quicker diagnoses and check for healing of grafts and ligament repairs with direct arthroscopic visualization, which will improve safety for patients. It will improve patient outcomes and patient satisfaction and, eventually, it will allow patients to get back to work and sports quicker because of the minimally invasive nature and ease-of-use of NanoScope technology.

Q. What are you most excited about for the future of Nano arthroscopy?

A. I am truly excited about the new procedures that we will develop using NanoScope technology. I am also excited about being able to check healing of ligament repairs, allografts, and orthobiologics using this technology. I am also excited about being able to use this technology in procedure rooms and in the office and hopefully on the field at some point in the future.

Rehab Corner

Interview With Dr. Steven S. Shin



Steven S. Shin, MD

Surgeons and therapists share a common goal of improving patient outcomes and experiences. A considerable part of this effort involves discovering and creating ways to help patients return to function as quickly and safely as possible following an injury or surgery.

While *InternalBrace*™ ligament augmentation is a surgical construct rather than a therapeutic modality, it is important for hand therapists to be informed of such advancements in technology and the direct impact they can have on a patient's rehabilitation course and recovery. Steve Shin discusses how he communicates with the hand therapists that he works with to ensure his patients are getting back to activity as quickly and as safely as possible.

Q. How do you start the conversation with your therapist?

A. I try to reach out to those therapists who I know have never worked with thumb UCL *InternalBrace* ligament augmentation patients and discuss with them what an *InternalBrace* augmentation is. However, hand therapists are smart...all they need is one discussion on the benefits of *InternalBrace* augmentation and they get it. They may be a little nervous at first because they don't want to "mess up" the surgery, but they soon realize that they won't because the *InternalBrace* construct won't let them. All of the therapists I've worked with quickly become excited about *InternalBrace* ligament augmentation because now they don't have to fight the scar tissue that happens as a result of the patient being casted for a month after the repair. Not only does the patient regain his/her motion and function faster, but the therapist also looks better to the surgeon.

One big benefit of the thumb CMC suspensionplasty using DX SwiveLock SL anchors and SutureTape suture is not having to sacrifice the patient's FCR tendon as done in LRTI. I have definitely seen less pain in my SwiveLock suspensionplasty patients and love that I don't have to explain to the patient why I have to sacrifice a tendon that isn't "guilty" of anything. The therapists see this difference as well and it makes their job a lot easier.

By the time I see these patients back at 1 month, many of them don't even need to see the hand therapist! Some patients still desire to see a hand therapist and I have no problem sending them to formal therapy for another 2 to 3 months.

Q. At what milestones do you expect communication from your therapist?

A. For thumb UCL *InternalBrace* augmentation, I receive a progress report from the therapist whenever the patient returns to see me, usually every 4 to 6 weeks. Most patients, however, are done with therapy within 2 to 3 months. Of course, most of the hand therapists I work with have my email address or cell number and know they can (and should) reach out to me with any questions or concerns.

For thumb CMC *InternalBrace* augmentation, my expectations are the same. I would receive a progress report whenever the patients return to see me, usually every month after starting therapy. Most patients are done with therapy by 3 to 4 months post-op.

Rehab Corner (Cont.)

Interview With Dr. Steven S. Shin

Q. Did you ever have an instance where there wasn't good communication with the hand therapist and the rehab was not accelerated as you would hope?

A. Yes. I had a few thumb UCL *InternalBrace*[™] augmentation patients in the beginning who did not realize the benefits of accelerated rehab because their therapists were not aware of what internal bracing was or were too nervous to start motion so early. As a result of this, the patients didn't get their thumbs moving until a month or so after their surgery, which is the same as a traditional non-*InternalBrace* augmentation repair. The patients' thumbs were stiff just like my previous non-*InternalBrace* augmentation patients. However, these patients still did fine in the long run.

If my thumb CMC *InternalBrace* augmentation patients end up seeing a therapist, the therapist is usually surprised at how well they are doing after a month of self-directed exercises. Many times the patient tells me at 8 to 10 weeks post-op that the therapist already discharged them because the patient was doing so well and didn't need therapy anymore!

Q. What is your preferred method of communication (phone, text, videos, face-to-face, etc)?

A. All of the above. I don't really have a preferred method of communication with my therapists; it's whatever is easiest for them and me. Sometimes phone and text just don't get the point across though, so I'll do FaceTime with the therapist, usually with the patient present, and I can see the patient's progress at that point in time.

Q. Anything else you think would be helpful for surgeons to know when embarking on this journey?

A. It's very important for surgeons to engage their therapists early, even before their patient's surgery, if possible. Educating their therapist on what an *InternalBrace* augmentation is and the benefits it affords will not only benefit the patient, but the surgeon and therapist as well.

ASHT TIMES
CE SUPPLEMENT

Arthrex *InternalBrace*[™] Ligament Augmentation: Impact on Rehabilitation

Courtney R. Middleton, OTR, OTR/L, CHT, CLT
Arthrex Hand & Wrist Specialist

LEARNING OBJECTIVES

After completion of this continuing education activity, participants should be able to...

- Define *InternalBrace* technology
- List the benefits of *InternalBrace* technology
- Identify applications for *InternalBrace* ligament augmentation in the hand and wrist
- Differentiate between traditional versus *InternalBrace* rehabilitation protocols
- Identify the therapist's role in patient care as it relates to *InternalBrace* ligament augmentation

Rehabilitation

Treatment UCL Rehabilitation	UCL Repair with <i>InternalBrace</i> Ligament Augmentation
<p>0-4 Weeks Post-Op</p> <ul style="list-style-type: none"> Post-op dressing from hospital to cast (flexion-based cast). Thumb active 4 weeks. 	<p>0-4 Weeks Post-Op</p> <ul style="list-style-type: none"> Post-op dressing 1-10 days. Thumb active 4 weeks. Respirator strap or splint off-axis based (if needed).
<p>4-6 Weeks Post-Op</p> <ul style="list-style-type: none"> Flexion-based protocol. Can be modified to hand-based. 	<p>4-6 Weeks Post-Op</p> <ul style="list-style-type: none"> ROM 7 weeks post-op. Avoid lateral stress.
<p>6-8 Weeks Post-Op</p> <ul style="list-style-type: none"> Lateral pinch 8 weeks post-op. Pinch oppositional pinch and lateral stress. Oppositional pinch and grip 10-12 weeks post-op. 	<p>6-8 Weeks Post-Op</p> <ul style="list-style-type: none"> Grip strength 12 weeks post-op. Oppositional pinch 8 weeks post-op. Pinch 8 weeks post-op.
<p>12 Weeks</p>	<p>8-6 Weeks</p>

Thumbs Carpometacarpal (CMC) Osteoarthritis

The goals of arthroscopic debridement and repair to function following *InternalBrace* application are not limited to thumb UCL repair alone. Thumb CMC osteoarthritis is a common upper extremity condition treated with surgery.^{1,2} The forces transmitted through grip and pinch stress on supporting ligaments, and degeneration of cartilage are thought to be the contributing factors to the development and progression of thumb CMC osteoarthritis.³ This process results in debilitating pain, limited mobility, swelling, instability, and dysfunction.⁴

Early-stage thumb CMC osteoarthritis is treated conservatively with one or more of the following: medication, splinting, joint protection techniques, strengthening exercises, and cryotherapy.^{5,6} When conservative treatment fails, surgical intervention is recommended.⁷ Multiple arthroscopic techniques are described for addressing the debilitating condition of thumb CMC osteoarthritis and are often generally referred to as thumb CMC arthroscopy. These include resection, transcapsular with tendon interposition, ligament reconstruction and tendon interposition, ligament arthroplasty, and suspension.⁸⁻¹¹

All surgical procedures share the common goal of decreasing pain and restoring function. Maximizing the functional range of the thumb following removal of the pathology is also desirable, not only for appearance but also for maintaining strength, mobility, and functional precision.¹² While many of the arthroscopic procedures mentioned address this goal directly through the loosening of tendons and/or soft-tissue suspension, temporary pinning of the first metacarpal to the second metacarpal can also be done to prevent metacarpal subluxation (and sometimes termed as the "stick-and-putty" space).¹³ Temporary pinning comes with the risk of pin migration and osteolysis outlined previously in the article and tendon loosening for appearance could be done at the metacarpal and increased pinch force suspension requires a

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© CE Supplement 1 | *InternalBrace* Ligament Augmentation Impact on Rehabilitation

For an in-depth overview of hand therapy protocols following *InternalBrace* ligament augmentation please review this [ASHT article](#). Tables 1 and 2 on the following pages are also from this article.

Rehab Corner (Cont.)

Thumb UCL and CMC *InternalBrace*™ Ligament Augmentation

Table 1. Thumb Ulnar Collateral Ligament Rehabilitation

UCL Rehabilitation	Traditional UCL Rehabilitation ¹	Traditional UCL Rehabilitation ²	UCL Repair With <i>InternalBrace</i> Ligament Augmentation
Immobilization	Post-op thumb spica cast, IPJ free × 4-6 weeks	Post-op dressing then transition to cast or forearm-based radial thumb spica × 4 weeks	Post-op dressing × 7-10 days Neoprene wrap or custom orthosis issued for comfort
Mobilization	IPJ: immediately post-op CMCJ: when post-op dressing is removed MCPJ: 4-6 weeks post-op	AROM: 4-6 weeks post-op Forearm-based arthrosis can be modified to hand-based PROM: 7 weeks post-op Avoid lateral stress	AROM/PROM: 7-10 days post-op
Strengthening	8 weeks post-op	Lateral pinch: 8 weeks post-op Avoid oppositional pinch and lateral stress Sustained pinch and grip: 10-12 weeks post-op	Grip strength: 2 weeks post-op Tip/3 jaw/lateral pinch: 3 weeks post-op
Return to Work and Unrestricted Activity	12 weeks	12 weeks	5-6 weeks

Various rehabilitation protocols are presented in the literature. Columns 2 and 3 depict resources that provide protocols based on a synthesis of the literature. Column 4 outlines the rehabilitation protocol following UCL repair with *InternalBrace* ligament augmentation shared by Drs. Steven Shin and Mojca Herman.

IPJ - Interphalangeal joint
CMCJ - Carpometacarpal joint
MCPJ - Metacarpophalangeal joint

AROM - Active range of motion
PROM - Passive range of motion
AAROM - Active assisted range of motion

References

1. Skirven TM, Osterman AL, Fedorczyk J, et al. Rehabilitation of the Hand and Upper Extremity. *Elsevier*; 2011.
2. de Herder E. Evidence Based Hand and Upper Extremity Protocols. ISBN-10 : 0578649020

Rehab Corner (Cont.)

Thumb UCL and CMC *InternalBrace*™ Ligament Augmentation

Table 2. Thumb CMC Arthroplasty Rehabilitation

	Traditional CMC Arthroplasty Rehabilitation¹	Traditional CMC Arthroplasty Rehabilitation²	Traditional CMC Suspension Arthroplasty Rehabilitation³	CMC Suspensionplasty With <i>InternalBrace</i> Ligament Augmentation⁴
Immobilization	Post-op dressing/thumb spica cast × 4 weeks Then transition to forearm-based thumb spica orthosis AROM of uninvolved joints: day 1 post-op	Post-op dressing × 2 weeks Then transition to case or forearm-based thumb spica orthosis ×2 additional weeks (Wrist neutral to 30° ext, MCPJ 0°, CMCJ mid palmar abduction)	Post-op cast (20° wrist ext, thumb midway between ext and abd, IPJ free) ×2 weeks then transition to short opponens AROM uninvolved joints 2 weeks post-op	Post-op dressing × 7-10 days Shin: Neoprene wrap or custom orthosis issued for comfort only Garcia: Custom orthosis worn during activity and sleep
Mobilization	PROM: 4 weeks post-op CMCJ abd ext only AROM: 8 weeks post-op (CMCJ palmer abduction, opposition, circumduction included)	AROM of uninvolved joints: 4 weeks post-op PROM: wrist/MCPJ 6 weeks post-op	AROM, AAROM, MCPJ/CMCJ: end of week 4 Opposition to base of 4th/5th restricted	AROM: 7-10 days Shin: Patients instructed in "gentle thumb alphabets" to be completed independently with formal therapy initiated at 4 weeks post-op
Discontinue Orthosis	Week 13-16	Week 8	Begin to wean end of week 6 Discontinue end of week 8	Weaned at 4 weeks Discontinued by 6 weeks
Strengthening	Isometric thenar strength: 8 weeks post-op (in direction of palmer abd) Lateral pinch/non-isometric thenar strength: 12 weeks post-op	8 weeks post-op (as tolerated; delay if painful)	Isometrics: 7 weeks post-op Pain-free opposition to tip of 5th digit permits slowly increasing flexion across palm Isotonics: 9 weeks post-op, gradually progressed	Shin: Grip and pinch initiated 4-6 weeks Garcia: Grip and pinch initiated 4 weeks
Unrestricted Activity/Return to Work or Sport	16-24 weeks	10-12 weeks	After 12 weeks	Shin: 6-12 weeks (Caveat: patient's functional activity is not restricted at any time. Patients are encouraged to do whatever they are able at any point in time.)

References

1. Skirven TM, Osterman AL, Fedorczyk J, et al. Rehabilitation of the Hand and Upper Extremity. *Elsevier*; 2011.
2. de Herder E. Evidence Based Hand and Upper Extremity Protocols. ISBN-10 : 0578649020
3. Ataker Y, Gudemez E, Ece SC, Canbulat N, Gulgonen A. Rehabilitation protocol after suspension arthroplasty of thumb carpometacarpal joint osteoarthritis. *J Hand Ther.* 2012 Oct-Dec;25(4):374-82; quiz 383. doi: 10.1016/j.jht.2012.06.002

Surgical Tips and Pearls

Bail Out for CMC *InternalBrace*™ Ligament Augmentation

CMC *InternalBrace* augmentation: for poor bone in the 2nd metacarpal, you can use a DX FiberTak® anchor. Drill the far cortex with the 1.6 mm drill, deploy the DX FiberTak anchor with SutureTape on the far side of the cortex (on the ulnar side of the bone between the thumb and the 2nd metacarpal), and bring the SutureTape to the SwiveLock® anchor on the first metacarpal.



Tips and Pearls: Inserting Nano SwiveLock Anchor



- Make sure to clear all soft tissues so that the black laser line on the guidewire is truly all the way down to cortex. If soft tissue is in the way of the drill guide, the hole won't be deep enough and the anchor body will be sticking out, even if it looks like it is buried. Confirm with fluoroscopy.

- Don't over-turn or over-push the driver. Two things can happen that will lead to the Nano body falling into the canal: the forktip will collapse and/or the forktip will be pushed into the canal, essentially making the hole deeper. Turn the driver until you start feeling resistance, then stop and disengage the driver from the anchor. Take a look and see if you need to bury further. Check under fluoroscopy.
- The Nano anchors were designed for the smaller bones, like the phalanges, so *InternalBrace* augmentation of the collaterals and volar plate at the PIP joint are the best indication for use of the Nano anchors.
- Slow and steady pressure to insert the SwiveLock anchor. This should NOT require any malleting.

Scientific Article Spotlight

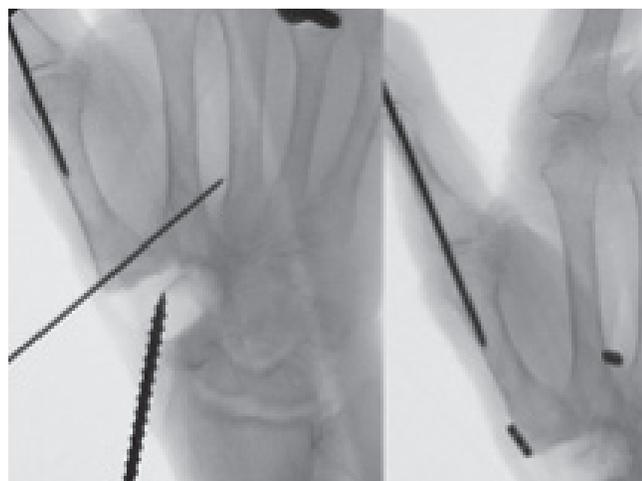
Mini TightRope® Fixation System and Thumb UCL Repair



Mini TightRope Fixation System

Hozack B, Fram B, Ilyas AM, et al. Optimal position of the suture button suspensionplasty (TightRope) for thumb basal joint arthritis [published online ahead of print, 2020 Feb 28]. *Hand*. 2020. doi: 10.1177/1558944720906551

The goal of the study was to assess the motion and stability in the high- or low-angle trajectory when placing a Mini Tightrope construct across the 1st and 2nd metacarpals.



Conclusion: Both TightRope constructs provided improved axial stability after trapeziectomy while not excessively limiting any one motion of the thumb. Compared to the high-angle trajectory, the low-angle TightRope placement provided a more stable construct with respect to subsidence and angular motion. Given the concern for excessive motion of the 1st metacarpal base with the high-angle construct, we recommend a low-angle trajectory TightRope placement.



Scapholunate Ligament Repair

Thompson RG, Dustin JA, Roper KD, et al. Suture tape augmentation for scapholunate ligament repair: a biomechanical study. *J Hand Surg AM*. 2020;S0363-5023(20)30376-2. doi: 10.1016/j.jhsa.2020.06.017

- This article looks at the maximum load to failure for specimens that were repaired and augmented with the *InternalBrace*™ construct versus a repair-only group. The surgeon used two Micro Corkscrew® anchors for the repair-only group versus two 3.5 mm SwiveLock® anchors and SutureTape for the *InternalBrace* augmentation group.

- Maximum load to failure (135 N; SD, 44.94 N) for specimens that were repaired and augmented with the *InternalBrace* construct was higher than that for specimens in the repair-only group (68 N; SD, 14.69 N).
- “These data demonstrate that SL ligament repairs augmented with suture tape have an increased load to maximum failure and are stronger under tensile loading than suture anchor fixation alone. This may prove to be beneficial in higher demand patients.”

Scientific Article Spotlight

Scapholunate Repair and Thumb UCL Repair

Thumb UCL Repair

Patel NA, Shin SS, Lee TQ, et al. Kinematics of thumb ulnar collateral ligament repair with suture tape augmentation. *J Hand Surg Am.* 2020;45(2):117-122. doi:10.1016/j.jhssa.2019.09.005

Addresses the question of whether the *InternalBrace*™ augmentation overconstrains the joint. The construct was able to restore varus-valgus kinematics after complete UCL tear.

“In addition, the higher angular stiffness afforded by the suture tape augmentation may allow for earlier rehabilitation after surgery.”



Thumb UCL Repair

Lee SJ, Rebinovich RV, Kim A. Thumb ulnar collateral ligament repair with suture tape augmentation. *J Hand Surg Asian Pac Vol.* 2020;25(1):32-38. doi:10.1142/S2424835520500046

- This study looked at the short-term outcomes for thumb UCL with repair and *InternalBrace* ligament augmentation.
- Average postoperative thumb metacarpophalangeal (MCP) and interphalangeal (IP) joint range-of-motion (ROM) were 0–57.5° and 0–71°, respectively, for chronic tears and 2.2–53.9° and 0–71°, respectively, for acute tears. Average grip and pinch strength relative to the unaffected hand were 102% and 84%, respectively, among patients with chronic tears and 103.3% and 88.7%, respectively, among those with acute tears. All patients demonstrated stability with a firm endpoint, relative to the unaffected thumb.

- Interestingly, three patients in our series with chronic repairs had a markedly less stout ligament than the remainder of the patients. This may highlight the applicability of primary repair and suture tape augmentation for chronic repairs with poor ligament substance, whereas reconstruction would be otherwise indicated.
- Thumb UCL repair with suture tape augmentation demonstrates short-term outcomes comparable to what has been reported for other methods of repair. It may potentially allow for an expedited recovery and rehabilitation process.

Abstract Corner

InternalBrace™ Ligament Augmentation

Published Articles

- Gibbs DB, Shin SS. Return to play in athletes after thumb ulnar collateral ligament repair with suture tape augmentation. *Orthop J Sports Med.* 2020;8(7). doi:10.1177/2325967120935063
- De Giacomo AF, Shin SS. Repair of the thumb ulnar collateral ligament with suture tape augmentation. *Tech Hand Up Extrem Surg.* 2017;21(4):164-166. doi:10.1097/BTH.0000000000000173
- Shin SS, van Eck CF, Uquillas C. SutureTape augmentation of the thumb ulnar collateral ligament repair: a biomechanical study. *J Hand Surg Am.* 2018;1.e1-e6. doi:10.1016/j.jhsa.2018.02.002
- Patel NA, Shin SS, Lee TQ, et al. Kinematics of thumb ulnar collateral ligament repair with suture tape augmentation. *J Hand Surg Am.* 2020;45(2):117-122. doi:10.1016/j.jhsa.2019.09.005
- Lee SJ, Rabinovich RV, Kim A. Thumb ulnar collateral ligament repair with suture tape augmentation. *J Hand Surg Asian Pac Vol.* 2020;25(1):32-38. doi: 10.1142/S2424835520500046
- Thompson RG, Dustin JA, Roper KD, Kane SM, Lourie GM. Suture tape augmentation for scapholunate ligament repair: a biomechanical study. *J Hand Surg AM.* 2020;S0363-5023(20)30376-2. doi: 10.1016/j.jhsa.2020.06.017

White Papers

- Arthrex, Inc. Scapholunate reconstruction: a biomechanical analysis of a novel technique. LA1-00053-EN_B. Naples, FL; 2017.
- Arthrex, Inc. Biomechanical testing of a ulnar collateral ligament repair: SwiveLock® anchor with InternalBrace ligament augmentation repair vs. SwiveLock anchor alone. LA1-00046-EN_A. Naples, FL; 2017.

- Arthrex, Inc. Fatigue loading of SutureTape for use as an InternalBrace™ ligament augmentation as part of an ulnar collateral ligament repair. LA1-00101-EN_A. Naples, FL; 2018.

Abstracts/Posters

2017

- Schwartzenberger JJ, Clark C, Santoni BG, Garcia M, Stone JD, Nydick J. Poster 146: Scapholunate ligament reconstruction using tendon autograft and 3.5 mm fork-tip interference anchors. Presented at: 72nd Annual Meeting of the American Society for Surgery of the Hand; September 7-9, 2017; San Francisco, CA.

2018

- Lee SJ, Coyle R, Porter DA, Kremenec I. Poster No. PO218: Biomechanical testing of scapholunate reconstruction with internal brace versus scapholunate repair. Presented at: AAOS 2018 Annual Meeting; March 6-10, 2018; New Orleans, LA.
- Gibbs D, DeGiacomo A, Shin SS. Return to play in high level athletes after thumb ulnar collateral ligament repair with suture tape augmentation. Presented at: FESSH 2018 Congress; June 13-16, 2018; Copenhagen, Denmark.
- Lee SJ, Porter D, Coyle R, Kremenec I. Trapeziectomy internal brace suspensionplasty versus ligament reconstruction tendon interposition for thumb carpometacarpal arthritis: a biomechanical study. Presented at: 73rd Annual Meeting of the ASSH; September 13-15, 2018; Boston, MA.
- Fujio K. Reconstruction for chronic scapholunate dissociation with DIC stabilized by RASL vs SwiveLock as internal splint. Presented at: FESSH 2018 Congress; June 13-16, 2018. Copenhagen, Denmark.

Abstract Corner (Cont.)

InternalBrace™ Ligament Augmentation

Abstracts/Posters (Cont.)

2019

- Orr S, Morse K, Meyers K, Weiland A. Scapholunate ligament reconstruction with InternalBrace technique provides biomechanically equivalent fixation compared to the percutaneous pin fixation in a cadaveric model. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Velasco-Gonzalez L, Almenara-Fernandez M, Wahab-Zuriarrain S, Lamas-Gomez C. Labral tape suture as an internal brace augmentation for a subacute scapholunate injuries. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Park Y, Shin SS, Lee T, et al. Internal brace augmentation of the scapholunate interosseous ligament repair: a biomechanical study. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Van Eck C, Papaliodis D, Shin SS. Suture tape stabilization of the fifth carpometacarpal joint in the elite athlete. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Shin SS, Patel N, Lee T, et al. Biomechanical analysis of thumb ulnar collateral ligament repair with suture tape augmentation. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Pereira E, Filippini Lorimier Fernandes L, Pereira L. A new technique to very chronic UCL injury without arthrosis – augmentation with Fiber Tape. Presented at: IFSSH/FESSH 2019 Congress; June 13-16, 2018. Berlin, Germany.
- Lee T, et al. Management of CMC joint arthritis with an internal brace and tendon interposition: a prospective case series. Presented at: 74th Meeting of the ASSH 2019; September; Las Vegas, NV.
- Lee T, et al. Thumb ulnar collateral ligament repair with suture tape augmentation. Presented at: 74th Meeting of the ASSH 2019; September; Las Vegas, NV.

- Doering TA, Larsen C; Greenberg A, Tuckman D. Prospective analysis of knotless suture anchor suspensionplasty for treatment of basal joint arthritis. Presented at: 74th Meeting of the ASSH 2019; September; Las Vegas, NV.
- Maniglio M, Park IJ, Shin S, et al. Fiber tape augmentation of the scapholunate interosseous ligament repair: a biomechanical study. Presented at: Swiss Society of Hand Surgery 2019; Interlaken, Switzerland.

2020

- Patel SS, Hachadorian M, Gordon A, Nydick J, Garcia M. Thumb metacarpophalangeal joint ulnar collateral ligament: early outcomes of suture anchor repair with suture tape augmentation. Poster presentation at: Meeting of the American Association for Hand Surgery 2020. Ft. Lauderdale, FL.



Distal Extremities Education



Hand, Wrist, and Elbow OTIF 2020

We hope that everyone is healthy and safe along with their families. We have very exciting updates to share with all of you.

The expansion of our headquarters was completed at the beginning of this year. Our beautiful complex is now composed of the previous Arthrex, Inc building, plus the addition of Arthrex One (a 6-story building), the Arthrex Wellness Center, and the Innovation Hotel. Pickleball courts, a high-end fitness center, a basketball court, and large green areas are other options our visitors will get to enjoy when coming to our educational events.

With the progressive increase on the educational demand in this subset of orthopedic surgery, we decided to add a new member to our hand, wrist and elbow team. Dr. Robert Kalapos, Clinical Specialist of Medical Education, joined us after obtaining his medical degree from the University of Pécs in Budapest, Hungary. The additional manpower has given us the ability to offer more symposiums and single-day labs, and even extend the reach of our hand and wrist regional tours.

We successfully held our hand, wrist, and elbow Orthopedic Technology and Innovation Forum (OTIF) in 2019 and 2020. Renowned hand surgeons from all over the world were invited to share their results through engaging case discussions and expert panels. More than 100 participants turned in for each one of these events. They really enjoyed them and found this novel educational format very informative, taking many tips and pearls back to their practices.

Our Annual North American Hand & Wrist Fellows Symposium was held at our headquarters in Naples on May 3rd and 4th of 2019. Almost 60 Fellows representing most training programs from the US and Canada participated in this one-of-a-kind educational event. With the arrival of the 1.9 mm NanoScope™ operative arthroscopy system, the Mini Comprehensive Fixation System (CFS), and the continuous expansion of *InternalBrace*™ technology for the hand and wrist, we increased the number of Nano arthroscopy and minimally invasive symposiums. Additionally, we started a program offering basic-to-advanced dry and wet Nano arthroscopy courses to fulfill the existing need in these areas.

Distal Extremities Education (Cont.)



Hand, Wrist, and Elbow OTIF 2020

We offered two independent workshops at the 2019 ASSH Annual Meeting in Las Vegas. Drs. Sanj Kakar and AJ Mencias shared their experience with 134 participants on the use of the NanoScope™ system as the next step in the evolution of hand and wrist arthroscopy. Drs. Randall Culp, Steven J. Lee, and Steven Shin held a very interesting case panel discussion for 164 attendees highlighting all the applications for hand and wrist *InternalBrace*™ technology.

We are happy to announce that the upper extremity module of OrthoPedia.com, our novel online educational platform for surgeons, is almost complete. The shoulder and elbow sections are currently active, and we launched the hand and wrist section last month. Viewers can take advantage of the nicely organized and comprehensive anatomy, biomechanics, and procedure-specific educational videos.

Finally, as we all know, the entire world was affected by the COVID-19 pandemic. The restrictions to prevent further dissemination of this viral infection prevented us from offering the unique on-site educational experience to our surgeon customers. This sudden obstacle did not stop us but, instead, gave us the strength and resolve to reinvent ourselves and our division of medical education to keep on fulfilling our mission of Helping Surgeons Treat Their Patients Better™.



American Hand and Wrist Fellows Symposium 2019

We have broadcasted a significant number of very dynamic webinars discussing the benefits of our arthroscopic and minimally invasive techniques for diverse hand, wrist, and elbow conditions. The response from the global orthopedic community has been extremely positive.

We once again want to express our most sincere gratitude to all the surgeon instructors in our educational force and to all the visitors who have taken the time to join us at our educational events. We are certain that a bright future is ahead for all of us. We look forward to a great 2021 for hand and wrist surgery.

Felix Riano, MD

Medical Education Manager
Hand, Wrist, and Elbow

Christopher Adams, MD

Arthrex VP, Global Medical Education
Diplomate of the ABOS

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2. Arthrex, Inc. Data on file (APT 283, 671, 682, 870, 1122, 1250, 1222, 1611, 2277, 2757, 2791A, 03465). Naples, FL; 2004-2017.
3. Shin SS, van Eck CF, Uquillas C. SutureTape augmentation of the thumb ulnar collateral ligament repair: a biomechanical study. *J Hand Surg Am*. 2018;1.e1-e6. doi:10.1016/j.jhsa.2018.02.002

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